



Inner child of the past: long-term protective role of childhood relationships with mothers and fathers and maternal support for mental health in middle and late adulthood

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Abstract

Purpose National longitudinal studies that investigate the long-term association between early family life and mental health in middle and older adulthood are limited. This study aims to fill the gap by examining the protective effect of positive childhood relationships with mothers and fathers and parental support against depression among women and men in middle and late adulthood.

Methods The sample of 12,606 adults (7319 females; 5287 males) from the US Health and Retirement Study was nationally representative with the inclusion of 7 depression measures from 2008 to 2018. Two depression measures, CESD-8 scale and binary indicators of severe depressive symptoms, were used. Generalized estimation equations (GEE)-negative binomial models were estimated for CESD-8 and GEE-logit models were estimated for the binary indicator of severe depression. This study aimed to assess how positive parent-child relationships and maternal support protect the mental health of women and men in adulthood. Other risk and psychosocial factors, such as childhood depression, traumatic life events, stressful life events, marital status, and social support in adulthood were adjusted for.

Results Positive childhood relationships with mothers, fathers, or both parents and increased maternal support were associated with a lower risk of depression among both females and males from middle to old age, even if they experienced trauma, stressful life events, divorce, singlehood, widowhood, or little social support. Females benefited more psychologically than males from positive mother-daughter relationships and high-quality relationships with both parents. However, compared to mother-child relationships, positive father-child relationships protected men better psychosocially than females.

Conclusion Findings underscore the importance of fathers' roles in promoting their children's, especially sons', emotional well-being. Interventions in early mother-child and father-child relationships and parental support are crucial for healthy aging in mental development.

Keywords Mother-child and father-child relationships · Positive childhood family relationships · Paternal support · Depression in middle and old adulthood · Life-time mental health

Introduction

*I want to give you something, my child,
for we are drifting in the stream of the world.
Our lives will be carried apart, and our love forgotten.*

*But I am not so foolish as to hope that I could buy your
heart with my gifts.*

*Young is your life, your path long, and.
You drink the love we bring at one draught and turn
and run away from us.*

Poet Rabindranath Tagore, The Gift

We wonder how long parental love lasts to protect us psychologically. Humans, no matter how old we are, probably are still the “inner child of the past” [1]. Childhood family experiences leave a lifelong emotional mark on individuals [2–4]. A recent longitudinal study found that positive adolescent family relationships have lasting benefits for mental

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health among females and males from adolescence to midlife [4]. Do positive family relationships last even longer to protect the mental health of both females and males from middle to oldest old age? Despite the fact that individuals face challenges from increasing hardships and stresses in middle adulthood and gradual physical and cognitive decline in late adulthood [5, 6], can parental love last to maintain positive psychological well-being till late adulthood? These questions remain calling for new investigations.

A number of studies have used small community samples and clinical data and found short-term benefits of positive parent–child relationships for mental health among children and adolescence [7–9]. Family is the first setting where individuals start their conceptualization of self and life [10, 11]. Parents are the most important caregivers in their children's early lives, providing esteem, worthiness, emotions, attitudes, direction, and guidance [1, 12]. Parent–child relationships play a critical role in shaping the emotional atmosphere where children start their lifelong journey [1, 13]. This emotional atmosphere may persist in adult life as individuals apply their parents' attitudes and emotions to “parent” themselves psychologically [1]. “The “inner child of the past” [may] continue, with all feelings and attitudes from parents, to the very end of our lives” [1].

According to the attachment theory (e.g., [14–19]), a child's sense of security is developed from the affectional bonds with the principal caregivers. When the emotional assurance in the availability, accessibility, and responsiveness of the attachment figure(s) is secured in times of need, such a child tends to view him/herself as worthy of love and caring and develop social skills to balance self-reliance and appropriate help-seeking capacities as s/he matures. In contrast, negative emotions, such as anxiety, sadness, depression, and anger, may be generated by the threatened loss or absence of attachment relationships.

Other perspectives have also been developed to understand the processes and mechanisms of how significant others' support (e.g., healthy parent–child relationships and parental support) may buffer the negative effects of major stressors on psychological well-being (e.g., [20–25]). For example, positive parent–child relationships and parents' devoted attention and time can provide the child with emotional support and instrumental coping assistance. Such parental support includes direct companionship, child concern and caring, valuing, compassionate presence, empathic understanding and accepting and validating feelings/concerns, and acts that alleviate tensions directly or boost young people's self-esteem and sense of belonging indirectly (e.g., [26–28]). This in turn may reduce one's emotional distress and enhance his/her psychological well-being.

In addition, parental coping assistance (e.g., information, advice, and encouragement) may directly protect psychological well-being and indirectly foster a sense of control to promote further problem- and emotion-focused coping strategies that may alleviate the negative consequences of stress [27]. Stressors can damage the individual's self-esteem, sense of belonging, ability to appraise the situation, and/or tangible recourses, and sense of control [29, 30]. Thus, a child needs to gain self-esteem support, belonging support, appraisal support, and instrumental support through good relationships with their parents to buffer stress. Chen and Harris's recent study [4] found that positive adolescent family relationships continue to benefit mental health till middle age. It implied the mechanism that social and emotional support gained in early family life likely encourages the development of skills to cope with changing and cumulative stressors throughout the life course in adulthood [4].

In addition, positive parent–child relationships and parental support experienced in young age may promote adequate brain structuring, and physiologic and neuroendocrine system regulation [13, 31, 32]. This may also foster development of social skills and abilities to cope with stress and adversity later in life [13, 26, 31–34]. In contrast, toxic stress through negative experiences in family relationships may damage the architecture of the developing brain, disturb the physiologic and neuroendocrine systems, and increase the risk of mental disorders in youth or adulthood [13, 32].

However, our scientific understanding of early family life and its long-term linkage with psychological well-being in middle and older adulthood is very limited [4, 35, 36]. Findings from longitudinal studies with national representation are scarce. Middle age is a peak period for high rates of depression which may be associated with premature deaths due to suicide, alcohol, and drug use [5, 37]. Depression, though less prevalent among older than younger adults, continues to be a frequent cause of emotional suffering and worsening quality of life in older adulthood [38–41]. High levels of depressive symptoms may be associated with increasing risk of dementia among older adults [42]. Treatment for depression in later life is costly and sometimes inefficient in reversing mental conditions [43]. New empirical evidence is needed to investigate the long-term association of early family relationships and parental support and mental health in middle and late adulthood. This will help facilitate the application of early prevention in family settings and cost-effective psycho-therapeutic analysis and intervention for adults who continued to be traumatized by childhood family experiences [7, 39, 44].

While previous research has extensively focused on mother–child relationships, few studies have examined

father–child relationships [45]. When the relationship was studied, fathers' financial contribution to their children's welfare or inadequate and absent fathering was usually the focus, especially among elderly birth cohorts [46, 47]. Studies have found average levels of paternal involvement have increased over time as social norms about fathers' responsibilities for child care have changed [48]. Fathers play a distinctive role in parenting and interact with children in different ways than mothers [48–50]. Involved fathers may have a stronger influence in shaping children's competence for handling and adapting to new changes, managing emotions, and adapting to stressful events [48, 50, 51]. New research is needed to understand the role and quality of the father–child relationship and its association with the emotional well-being of individuals later in life.

The current study

This study aimed to make several contributions to our understanding about the longitudinal linkage of early family relationships and parental support and mental health in mid- and late life. The study used a US national representative sample of adults over 50 years of age to assess separately the long-term association between childhood relationships with the mother and father and depressive symptoms in middle and older adulthood. Second, the less-studied father–child relationship was included to understand fathers' roles in shaping their children's long-term mental health. Third, as additional measures about mother–child relationships were available in the data, maternal support through devoted attention, time, and effort in childrearing was also examined.

Fourth, a thorough approach was taken by including two outcome variables to examine depression: (1) depressive symptoms measured by the CESD scale; and (2) a binary indicator to measure severe depression symptoms. Fifth, gender differences in depression have been well documented from young to older age, with females generally experiencing higher levels of depression than males [4, 52, 53]. The role of early family relationships in mental health tend to operate differently between females and males [4, 54]. Thus, this study examined gender-specific depressive symptoms by age groups and differential benefits of positive mother–child and father–child relationships associated with depressive symptoms by females and males separately.

Sixth, the association of early parent–child relationships and parental support and mental health in later life was examined when other risks or protective factors for adult depressive symptoms were adjusted for. Previous research found some risk factors in family settings (e.g., neglect, abuse, and financial instability) for youth depression [9, 55–62]. Other risk factors, such as childhood depression [63], health status [64], traumatic events (e.g., death of a

child, natural disaster, life-threatening illness or accident) [61, 62], and stressful life events (e.g., job loss, home burglary, and worsened residential condition) [65] were also found for adult depression. Positively, social support gained (through marriage, friendship, and family) in adulthood was found to reduce the risk of adult depression [66, 67].

Based on the understanding of existing literature, the following hypotheses were formulated for this study:

Hypothesis 1 Positive mother–child relationships are associated with lower levels of depressive symptoms for both females and males in middle and oldest old age.

Hypothesis 2 Positive father–child relationships are associated with lower levels of depressive symptoms for both females and males in middle and late adulthood.

Hypothesis 3 Positive maternal support through devoted attention, time, and effort are associated with lower levels of depressive symptoms for both females and males in middle and oldest old age.

Hypothesis 4 The association between positive parent–child relationships and maternal support and better mental health will persist in middle and late adulthood when childhood and adulthood risk and protective factors are adjusted for.

Methods

Sample

Data from the U.S. Health and Retirement Study (HRS 1992–2018) were used [68].¹ HRS main survey has been fielded every 2 years since 1992 and recruited seven birth cohorts. Since 2008 (Wave 9), the HRS has employed a mixed mode survey design and randomly selected half of the sample to collect psychosocial data in greater depth through mail-in questionnaires. They were completed after the core interview. As my predictors and other key control variables came from the mail-in psychosocial questionnaire starting in 2008, the study sample was comprised of 7,319 females and 5,287 males with a total of 12,606 respondents ages 51 and 95 years. It included respondents who had psychosocial data, non-zero sample weight, and at least one wave of data

¹ HRS is an on-going nationally representative longitudinal study of U.S. men and women aged 51 years or older who were not institutionalized at baseline and born between 1890 and 1965. Respondents who were aged 96 years or older were excluded due to the small subsample size of this age group.

(2008–2018)² on the depression measure, and were not missing other covariates.

Measures

Depressive symptoms

Two outcomes were used for this study. One was a CESD-8 scale (with a count of depressive symptoms ranging from 0 to 8). The other was a *binary* depression measure, with 1 indicating severe depressive symptoms. The measures were derived from CESD-8 (the eight-item Center for Epidemiologic Studies–Depression scale). First, a linear count composite measure was constructed at each wave. It was comprised of participants' binary (yes or no) responses to eight items, with possible values ranging from 0 to 8. For these eight items, respondents were asked whether over the past week they (1) felt depressed, (2) felt like everything was an effort, (3) had restless sleep, (4) felt happy (reverse-coded), (5) felt lonely, (6) enjoyed life (reverse-coded), (7) felt sad, or (8) could not get going. The shorter 8-item CESD is a valid and reliable instrument of depression among adults, especially older adults [73, 74].

Second, those who reported four or more depressive symptoms at every wave were coded as 1. The cutoff of four or more symptoms was chosen and found to produce comparable results to the 16-item cutoff for the well-validated 20-symptom CESD scale. It reflected a severe level of depressive symptoms to be clinically noteworthy but not used as a diagnostic category [74, 75]. The binary version was slightly different from the CESD-8 scale. It was commonly used in psychology and epidemiology literatures, aiming to capture and indicate a high likelihood of clinical depression [74, 76]. Respondents had multi-wave CESDs with a maximum of six waves of data over a 10-year period (across 2008–2018 biennial surveys). The initial depression

measure was used at the time when their psychosocial data were first available (e.g., 2008 or 2010 survey).

Mother–child and father–child relationships

Positive mother–child and father–child relationships as binary indicator variables were used. Respondents were asked one time in the follow-up mail-in psychosocial questionnaire which retrospectively collected early life experiences. The questionnaire asked two separate questions about how much they agreed or disagreed that they had a positive relationship with their mother or father early in life before age 18 (1, strongly disagree; 2, disagree; 3, neither agree or disagree; 4, agree; 5, strongly agree). For each measure, a binary indicator of a positive parent–child relationship (coded as 1) was created based on face validity. Positive relationships were assigned if the respondent agreed or strongly agreed if they had a positive relationship with their mother or father before age 18 years.

Maternal support

This study also explored alternative parental support measures (not available for the father–child relationship) for mother–child relationships. It was operationalized by two measures. The respondent was asked one time in psychosocial questionnaire (1, a lot; 2, some; 3, a little; 4, not at all): “think about your childhood growing up, before you were 18 years old (1) how much time and attention did your mother give you when you needed it? (2) how much effort did your mother put into watching over you and making sure you had a good upbringing?” Both measures were reversely coded with 1 indicating little maternal support and 4 meaning a lot of support.

Control variables

Multivariate analysis controlled for a series of sociodemographic and psychosocial variables (described in Table 1). Sociodemographic measures included race/ethnicity, years of parental education (as a proxy for childhood socioeconomic environment), and respondent's educational level.³ Psychosocial measures included childhood abuse, childhood depression history, stressful life events, traumatic events in adulthood, marital status, and social support from children, family and friends. Childhood depression was a categorical variable (1, yes;

² The number of respondents with one wave of CESD data was a very small portion (0.79% of the total sample; 48 females and 51 males). Some researchers view that more data means more useful information that can reduce bias and increase statistical power in longitudinal analysis [69]. Cases with one-time point help contribute to the means of the outcome variable at that time point and worth retaining. Given that the number of participants with one-time measure on depressive symptoms was scarce and its impact on the estimates of GEE models was likely to be minimal, these cases were not excluded to maintain a slightly larger sample size. In addition, GEE models applied for longitudinal data have the advantage of not disregarding participants with incomplete or missing data [70]. While GEE models can account for clustering of longitudinal measures, they are marginal models for longitudinal data without estimating random effects [71]. Its application is suitable for data with missing values among the time points [72].

³ Cohort variables and their interaction with relationship measures were originally included but dropped, as cohort effects were not statistically significant ($p > .05$) in multivariate models.

Table 1 Sample demographics and study characteristics

	Full sample (N=12,606)	Female (N=7,319)	Male (N=5,287)
Mother–child relationship before age 18, N (percent)			
Poor	2412 (19.13)	1663 (22.72)	749 (14.17)
Good	10,194 (80.87)	5656 (77.28)	4538 (85.83)
Father–child relationship before age 18, N (percent)			
Poor	3230 (25.62)	1926 (26.32)	1304 (24.66)
Good	9376 (74.38)	5393 (73.68)	3983 (75.34)
Mother's attention and time (range 1–4), mean (SD)			
Mother's effort watching over (range 1–4), mean (SD)	3.49 (0.0068)	3.44 (0.0094)	3.56 (0.0098)
Age group			
51–55 years	2073 (16.44)	1237 (16.9)	836 (15.81)
56–60 years	2436 (19.32)	1422 (19.43)	1014 (19.18)
61–65 years	1589 (12.61)	982 (13.42)	607 (11.48)
66–70 years	2259 (17.92)	1278 (17.46)	981 (18.55)
71–75 years	1832 (14.53)	1010 (13.8)	822 (15.55)
76–80 years	1173 (9.31)	656 (8.96)	517 (9.78)
81–85 years	739 (5.86)	415 (5.67)	324 (6.13)
86–90 years	396 (3.14)	252 (3.44)	144 (2.72)
91–95 years	109 (0.86)	67 (0.92)	42 (0.79)
Race/ethnicity, N (percent)			
Non-Hispanic white	9646 (76.52)	5517 (75.38)	4129 (78.1)
Non-Hispanic black	1530 (12.14)	978 (13.36)	552 (10.44)
Non-Hispanic other race	315 (2.5)	177 (2.42)	138 (2.61)
Hispanic	1115 (8.84)	647 (8.84)	468 (8.85)
Education, N (percent)			
Less than high school	1722 (13.66)	1019 (13.92)	703 (13.3)
High school degree or GED	6746 (53.51)	4140 (56.57)	2606 (49.29)
Some college	798 (6.33)	485 (6.63)	313 (5.92)
College degree or higher	3340 (26.5)	1675 (22.89)	1665 (31.49)
Years of parental education (range 0–17), mean (SD)	9.86 (3.42)	9.79 (3.38)	9.96 (3.49)
Depression before age 16, N (percent)			
No	12,261 (97.26)	7070 (96.6)	5191 (98.18)
Yes	345 (2.74)	249 (3.4)	96 (1.82)
General health, N (percent)			
Excellent	1714 (13.6)	984 (13.44)	730 (13.81)
Very good	4181 (33.17)	2418 (33.04)	1763 (33.35)
Good	3914 (31.05)	2248 (30.71)	1666 (31.51)
Fair	2128 (16.88)	1255 (17.15)	873 (16.51)
Poor	669 (5.31)	414 (5.66)	255 (4.82)
Mean (SD)	2.67 (0.01)	2.69 (0.01)	2.65 (0.01)
Physical abuse by either parent before age 18, N (percent)^a			
No	11,713 (92.92)	6747 (92.18)	4966 (93.93)
Yes	867 (6.88)	560 (7.65)	307 (5.81)
Missing	26 (0.21)	12 (0.16)	14 (0.26)
Index of stressful life events in adulthood (range 0–5), mean (SD) ^b	0.33 (0.68)	0.32 (0.66)	0.35 (0.71)
Index of traumatic events in adulthood (range 0–7), mean (SD) ^c	1.18 (1.71)	1.17 (1.16)	1.21 (1.19)
Demographics and characteristics			
Marital status, N (percent)			
Married/partnered	8868 (70.35)	4565 (62.37)	4303 (81.39)
Separated/divorced	1523 (12.08)	1035 (14.14)	488 (9.23)

Table 1 (continued)

	Full sample (N=12,606)	Female (N=7,319)	Male (N=5,287)
Widowed	1709 (13.56)	1429 (19.52)	280 (5.3)
Never married	506 (4.01)	290 (3.96)	216 (4.09)
Number of close relationships with children, friends and other family members (range 0–221), mean (SD)	10.03 (10.07)	10.17 (0.11)	9.84 (10.85)
Grand mean CESD-8, mean (SD)	1.27 (1.86)	1.41 (1.96)	1.06 (1.67)
Predicted CESD-8 scale by age group (CI) ^d			
51–55 years***	1.31 (1.23, 1.40)	1.45 (1.35, 1.55)	1.14 (1.06, 1.22)
56–60 years***	1.27 (1.20, 1.34)	1.40 (1.32, 1.49)	1.11 (1.04, 1.18)
61–65 years***	1.15 (1.07, 1.23)	1.27 (1.17, 1.36)	1.01 (0.94, 1.09)
66–70 years***	1.15 (1.09, 1.21)	1.26 (1.19, 1.34)	1.01 (0.95, 1.07)
71–75 years***	1.25 (1.18, 1.32)	1.37 (1.29, 1.46)	1.09 (1.02, 1.16)
76–80 years***	1.37 (1.28, 1.46)	1.53 (1.42, 1.64)	1.20 (1.11, 1.28)
81–85 years***	1.33 (1.22, 1.43)	1.47 (1.34, 1.59)	1.15 (1.06, 1.25)
86–90 years***	1.43 (1.28, 1.59)	1.58 (1.40, 1.75)	1.23 (1.10, 1.36)
91–95 years***	1.86 (1.57, 2.14)	2.09 (1.75, 2.43)	1.56 (1.34, 1.78)
Severe depressive symptoms (CESD-8 > = 4), percent	8.37	9.98	6.06
Predicted percent of severe depressive symptoms (CESD-8 > = 4) (CI) ^d			
51–55 years***	9.72 (8.60, 10.85)	11.34 (10.00, 12.67)	7.70 (6.61, 8.79)
56–60 years***	8.97 (8.05, 9.90)	10.47 (9.35, 11.60)	7.09 (6.17, 8.00)
61–65 years***	7.46 (6.45, 8.46)	8.72 (7.55, 9.89)	5.87 (4.91, 6.82)
66–70 years***	7.06 (6.27, 7.85)	8.26 (7.29, 9.24)	5.55 (4.80, 6.30)
71–75 years***	7.51 (6.59, 8.43)	8.78 (7.65, 9.91)	5.91 (5.06, 6.75)
76–80 years***	8.43 (7.17, 9.69)	9.85 (8.33, 11.36)	6.65 (5.54, 7.76)
81–85 years***	7.89 (6.45, 9.33)	9.22 (7.52, 10.92)	6.21 (4.96, 7.46)
86–90 years***	8.18 (6.05, 10.31)	9.56 (7.09, 12.03)	6.45 (4.66, 8.24)
91–95 years***	11.07 (7.16, 14.99)	12.88 (8.38, 17.39)	8.80 (5.53, 12.06)

***P < 0.001, **P < 0.01, *P < 0.05

Notes: Abbreviations: SD standard deviation, CI confidence interval

^aRespondents were asked (1, yes; 2, no): “Before you were 18 years old, were you ever physically abused by either of your parents?” The number of missing for this physical abuse measure was scarce (only 12 cases out of 7,319 females; 14 cases out of 5,287 males) and they were not significantly different ($P > 0.05$) from the group who reported no physical abuse before age 18. These cases were kept to maintain the same sample size that included the rest of the variables

^bSum of ever experienced five stressful life events in the past 5 years as the respondent was asked:

- (1) Have you involuntarily lost a job for reasons other than retirement at any point in the past 5 years?
- (2) Have you been unemployed and looking for work for longer than 3 months at some point in the past 5 years?
- (3) Was anyone else in your household unemployed and looking for work for longer than 3 months in the past five years?
- (4) Have you moved to a worse residence or neighborhood in the past 5 years?
- (5) Were you robbed or did you have your home burglarized in the past 5 years?

^cSum of ever experienced seven traumatic events as respondents was asked

- (1) Has a child of yours ever died?
- (2) Have you ever been in a major fire, flood, earthquake, or other natural disaster?
- (3) Have you ever fired a weapon in combat or been fired upon in combat?
- (4) Has your spouse, partner, or child ever been addicted to drugs or alcohol?
- (5) Were you the victim of a serious physical attack or assault in your life?
- (6) Did you ever have a life-threatening illness or accident?
- (7) Did your spouse or a child of yours ever have a life-threatening illness or accident?

^dWald test results showed that gender differences are statistically significant at $P < 0.001$

2, no), which was derived from the response to the question on “before you were 16 years old, did you have the following childhood diseases as depression?”.

As the report of parent–child relationships may have been affected by child’s depressive mood, childhood depression was adjusted for. Although parental depression was not available in HRS, childhood depression was likely associated with parental mental state [77]. Longitudinal data with rich measures of family relationships, parental mental health, and child’s psychological well-being are scarce. To conduct sensitivity analyses, this study used alternative data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) as it has parental feelings of unhappiness as a proxy measure for parental mental state. This aimed to assess whether parental emotional well-being would diminish the association between early family relationships and long-term mental health. Using the same measures from Chen and Harris’ study [4], the sensitivity analysis showed that the parent–child relationships continued to be positively associated with lower levels of depression when parental depressive mood was adjusted for (eTable 1).

As for lifetime trauma in adulthood, HRS adopted the items developed by Krause, N., Shaw, B. A., & Cairney, J. [78]. Respondents were presented with seven potentially traumatic experiences and asked if they experienced each traumatic experience at any point in their life: (1) Has a child of yours ever died? (2) Have you ever been in a major fire, flood, earthquake, or other natural disaster? (3) Have you ever fired a weapon in combat or been fired upon in combat? (4) Has your spouse, partner, or child ever been addicted to drugs or alcohol? (5) Were you the victim of a serious physical attack or assault in your life? (6) Did you ever have a life-threatening illness or accident? (7) Did your spouse or a child of yours ever have a life-threatening illness or accident? An index was created by summing the number of positive responses to the seven items using HRS’s definition [79].

HRS also asked respondents about stressful life events: “Now please think about the last 5 years and indicate whether each of the events below occurred: (1) Have you involuntarily lost a job for reasons other than retirement at any point in the past five years? (2) Have you been unemployed and looking for work for longer than 3 months at some point in the past five years? (3) Was anyone else in your household unemployed and looking for work for longer than 3 months in the past five years? (4) Have you moved to a worse residence or neighborhood in the past five years? (5) Were you robbed or did you have your home burglarized in the past five years? (6) Have you been the victim of fraud in the past five years?” An index was created by summing the number of positive responses to the six items [79, 80]. Stressful life events and lifetime

traumatic events had no collinearity problem⁴ and thus were included in the multivariate model simultaneously.

Statistical analysis

Two outcomes of depressive symptoms were used. For descriptive purposes, two unconditional models by age groups and predicted values of the two outcome variables were estimated by females and males separately. In the multivariate analysis, conditional models were estimated for these two outcomes. Both unconditional and conditional models estimated generalized estimation equations (GEE). GEE models were appropriate for multivariate analysis as the goal was to estimate population-averaged models. The unstructured correlation was specified for the panel data of the depression measures. As outcome variables came from multiple waves, the GEE models took into account the correlation within the respondent on multi-wave depression measures and corrected standard errors to produce less biased estimates [82]. The application of GEE models can address non-independence in the data while also avoiding problematic assumptions that other longitudinal methods make about the data-generating distribution [82]. Its application is also suitable for data with missing values among the time points [72].

When the outcome was the count of eight depressive symptoms (CESD-8 scale), GEE models applied the negative binomial distribution family and link (negative binomial GEE). This modeling strategy properly fit the count nature of depressive symptoms to account for the over-dispersion in variation of the outcome variable. Exponentiated coefficients (e^β) were calculated to represent the ratio of estimated number of the depressive symptoms.⁵ It would show the percent change in the expected number of depressive symptoms for one unit change in a predictor (X).

⁴ The correlation coefficient for the two measures was 0.11. Stressful life events (Y) were regressed on traumatic events (X). Variance inflation factor (VIF) was calculated and its value was 1.01, which was much lower than the commonly used cutoff of 10 [81].

⁵ Coefficients of negative binomial GEE models (NB-GEE) were interpreted as the difference between the log of expected numbers of the Y variable. This can be written as $\beta = \log(\mu_{x_0+1}) - \log(\mu_{x_0})$, where β is the regression coefficient, μ is the expected count and the subscripts represent where the predictor variable, say X, is evaluated at X_0 and X_0+1 (implying a one unit change in the predictor variable X). The difference of two logs is equal to the log of their quotient, $\log(\mu_{x_0+1}) - \log(\mu_{x_0}) = \log(\mu_{x_0+1} / \mu_{x_0})$. Therefore, it can also be interpreted as the parameter estimate as the log of the ratio of expected number/count of Y. The exponentiated $\log(\mu_{x_0+1} / \mu_{x_0})$ is $(\mu_{x_0+1} / \mu_{x_0})$. Thus, the exponentiated value of the coefficient β from NB-GEE models is actually the ratio of the estimated number/count of Y [83, 84].

In descriptive analysis, predicted count/number of depressive symptoms by nine age groups was estimated for the full, female, and male samples. When the outcome was the binary indicator of severe depressive symptoms (an indicator for four or more depressive symptoms), GEE models applied the binary distribution family and logit link (logit GEE). In descriptive analysis, predicted percent (from probability) of severe depression symptoms by nine age groups was estimated for the full, female, and male samples. Wald tests were conducted to examine whether gender differences in the number of depressive symptoms and percent of severe depressive symptoms were statistically significant.

In multivariate analysis, five sets of GEE models were analyzed with each set estimating two models for each measure of depressive symptoms. The first set included mother–child relationships as the key predictor. The second set included father–child relationships as the main predictor. In addition, the third set included both mother–child and father–child relationship variables as the primary predictors.⁶ The fourth set included mother’s attention and time as the key predictor. The fifth set included mother’s effort as the primary predictor.

In each set, Model 1 included the main predictor variable(s) (mother–child relationship or/and father–child relationship, mother’s attention, or mother’s effort) and age group variable (with nine groups: 51–55 years, 56–60 years, 61–65 years, 66–70 years, 71–75 years, 76–80 years, 81–85 years, 86–90 years, and 91–95 years). Model 2 added control variables: (1) sociodemographic factors (race/ethnicity, parents’ years of education, and respondent’s education) [85], (2) psychosocial context (physical abuse by either parent before age 18; cumulative stressful life events during adulthood, lifetime traumatic events during adulthood), (3) health history and status (depression history before age 16; self-reported health), and (4) social support (marital status; number of close relationships with children, family members, and friends). Model 2 assessed whether differences in levels of depressive symptoms (ratio of the number of CESD-8; odds ratios for binary version of severe depressive symptoms) by each predictor remained statistically significant when sociodemographic and other risk and protective factors were held constant.

Model 2 in the conditional logit GEE model was used to estimate the predicted value of severe depressive symptoms. Specifically, predicted percentage of severe depressive symptoms was calculated for every age group by two levels of relationship variables. Wald test was conducted to evaluate whether percentages of severe depressive symptoms were

significantly different by two levels of relationships at each age group.

A separate logit GEE model was also run to include gender, mother–child relationships, and the interaction term between these two variables. Additive and multiplicative scales for the interaction were calculated [86] to assess whether the association between positive mother–child relationships and decreasing level of depression was stronger for females than males.

Two additional steps were applied to explore the extent to which the focal predictors account for depressive symptoms in middle and old adulthood. First, childhood depression was included in the age-adjusted GEE model to assess the association between depression at a young age and levels of depressive symptoms measured by CESD-8 in later life. Second, each of the five key predictors was added to generate five negative binomial GEE models for the CESD-8 scale. This aimed to understand the extent to which these childhood family measures account for the developmental changes in depression from childhood to late adulthood.

Statistical analyses applied weights developed and recommended by HRS for the subsample of mail-in psychosocial questionnaires. This can account for the unequal probabilities of sample selection and non-response at each wave to produce population and unbiased estimates [87]. All analyses were performed in Stata, version 16.0 (Stata Corp). A 2-tailed $P < 0.05$ was considered to be statistically significant.

Results

Table 1 presents the descriptive statistics for both dependent and independent variables. Although 10,194 respondents (80.87%) experienced a positive mother–child relationship and 9,376 respondents (74.38%) had a positive father–child relationship before age 18 years, males had better relationships with their mother and father during childhood than females. The mean index of attention and time received from the mother was 3.49, with males reporting to receive more attention from the mother than females. The mean index of the effort the mother put into care of the child was 3.64, with males reporting experiencing similar efforts from their mothers as females.

Estimated CESD-8 scale by age groups (from the negative binomial GEE models) (Table 1) showed the number of depressive symptoms in the full, female, and male samples. Those aged 51–55 years reported a relatively higher number of depressive symptoms than the grand mean (1.27 [full sample]; 1.41 [females]; and 1.06 [males]). The number of depressive symptoms measured by the CESD-8 gradually dropped from 56 to 70 years, then started to rise among the age group of 71–75 years, and reached the highest among

⁶ When both parent–child relationship variables were included in the same model, the aim was to examine whether the mother–child relationship would remain significant and changes in its coefficient when the father–child relationship was held constant and vice versa.

Table 2 GEE models with main predictors

Primary predictor in each GEE model	Model 1 Mother–daughter RL	Model 2 Father–daughter RL	Model 3 Mother–daughter and father–daughter RL	Model 4 Mother’s attention	Model 5 Mother’s effort
A. Negative binomial GEE models on count of depressive symptoms (CESD-8 scale)					
<i>Female (N=7,319)—ratios of estimated number of CESD-8</i>					
	0.877*** (0.853–0.901)	0.893*** (0.869–0.916)	0.904*** (w/ mother) (0.877–0.932)	0.915*** (0.903–0.927)	0.914*** (0.902–0.925)
			0.931*** (w/ father) (0.903–0.959)		
Primary predictor in each GEE model	Mother–son RL	Father–son RL	Mother–son and father–son RL	Mother’s attention	Mother’s effort
<i>Male (N=5,287)—ratios of estimated number of CESD-8</i>					
	0.875*** (0.833–0.920)	0.850*** (0.815–0.886)	0.945 (w/ mother) (0.891–1.001)	0.913*** (0.893–0.935)	0.898*** (0.877–0.919)
			0.868*** (w/ father) (0.826–0.911)		
Primary predictor in each GEE model	Mother–daughter RL	Father–daughter RL	Mother–son and father–son RL	Mother’s attention	Mother’s effort
B. Logistic GEE model on binary measure of severe depressive symptoms					
<i>Female (N=7,319)—odd ratios</i>					
	0.574*** (0.496–0.664)	0.616*** (0.535–0.709)	0.655*** (w/ mother) (0.555–0.772)	0.664*** (0.614–0.717)	0.655*** (0.605–0.710)
			0.730*** (w/ father) (0.623–0.856)		
Primary predictor in each GEE model	Mother–son RL	Father–son RL	Mother–son and father–son RL	Mother’s attention	Mother’s effort
<i>Male (N=5,287)—odds ratios</i>					
	0.585*** (0.458–0.748)	0.533*** (0.433–0.655)	0.778 (w/ mother) (0.576–1.050)	0.690*** (0.609–0.781)	0.647*** (0.565–0.741)
			0.584*** (w/ father) (0.453–0.752)		

Notes: age group variables were included in each model

*** p <0.001, ** p <0.01, * p <0.05

those aged 91–95 years ([1.86; 95% CI 1.57–2.14; full sample]; [2.09; 95% CI 1.75–2.43; females]; and [1.56; 95% CI 1.34–1.78; males]). Females reported higher number of depressive symptoms while males’ reported lower number of depressive symptoms as compared to the full sample. Females reported significantly higher level of depressive symptoms than males at every age group from 51 to 95.

Predicted percentage based on the estimated probability of experiencing severe depressive symptoms (4 + symptoms) (from the logit GEE models) for the full, female, and male samples was also shown by age groups (Table 1). The percentage of experiencing 4 or more depressive symptoms was highest among the oldest age group of 91–95 ([11.07%; 95% CI 7.16–14.99%; full sample]; [12.88%; 95% CI 8.38–7.39%; females]; [8.80%; 95%

CI 5.53–12.06%; males]) and second highest among the youngest age group of 51–55 years, followed by the next middle-aged group of 56–60 years and an old age group of 76–80 years. The percentage of these age groups (ages 51–55, 56–60, and 76–80, 91–95 years) were all above the grand mean (8.37% [full sample]; 9.98% [females]; 6.06% [males]).

The percentage of severe depressive symptoms dropped (except for the males aged 86–90 years) below the grand mean among the age groups between 61 and 75 years and between 81 and 90 years with the age group of 86–90 years having the highest percentage among these five age groups. Females had a higher percentage of severe depressive symptoms while males had a lower percentage than the full sample. Females had a significantly higher percentage of

experiencing four or more depressive symptoms than males from ages 51 to 95 years.

The ratio of predicted number of depressive symptoms (from negative binomial GEE models with focal predictors) are shown in Table 2A. Odds ratios (from logit GEE models with key predictors) for the binary dependent variable of severe depressive symptoms are shown in Table 2B. Among both females and males, the ratio of the estimated number of CESD-8 was lower than 1. This indicated that those who had positive childhood relationships with their mother or father likely had lower number of depressive symptoms than those who had poor relationships with their mother or father (Models 1 and 2 in Table 2A).

The odds ratio of severe depression was also statistically significantly ($p < 0.001$) lower than 1. This implied that those who experienced positive parent–child relationships were likely to have lower odds of experiencing severe depressive symptoms as compared to those who experienced low-quality relationships (Models 1 and 2 in Table 2B). In addition, both females and males whose mothers were more supportive (more attention, time, and effort devoted toward their child) were likely to have a lower number of depressive symptoms and odds of severe depression than those whose mothers were less supportive (Models 4 and 5 in Table 2A and B).

eTable2 shows the ratio of the estimated number of depressive symptoms (from the conditional negative binomial GEE models) when socioeconomic, psychosocial, and health factors were added and controlled for. eTable 3 shows the odds ratio (from the conditional logit GEE models) for the binary measure of severe depressive symptoms when the same set of control variables were added in these models.

When these socioeconomic, psychosocial, and health factors were added to each model and adjusted for (eTable 2), the associations of positive mother–child or father–child relationships and lower number of depressive symptoms (measured by CESD-8) remain statistically significant ($p < 0.001$) among both middle- and older-aged women and men. Having higher quality relationships with the *mother* in childhood, females had 4% [95% CI 2–6%] lower number of depressive symptoms and males had 5% [95% CI 2–8%] lower number of CESD-8 than their counterparts who experienced poorer *mother*–child relationships (Model 1). With improved relationships with the *father*, females had 4% [95% CI 2–6%] lower number of depressive symptoms and males had 7% [95% CI 4–10%] lower number of CESD-8 than their counterparts who experienced lower quality *father*–child relationships (Model 2).

The association between higher levels of the mother's devoted attention and time and effort toward the child and lower number of depressive symptoms appeared to remain significant as well after the adjustment for the control factors among middle- and older-aged females and males ($p < 0.001$

[female]; $p < 0.01$ or $p < 0.05$ [male]; eTable 2). Experiencing their mothers' more devoted attention and time towards them during childhood, females had 3% ([95% CI 2–4%]) lower number of depressive symptoms and males had 4% ([95% CI 3–6%]) lower number of CESD-8 in middle and later adulthood than their counterparts whose mothers spent less time with and paid less attention to them (Model 4). Females had 3% ([95% CI 2–4%]) lower number of depressive symptoms and males had 2.4% ([95% CI 0.7–4.1%]) lower number of CESD-8 when their mothers made more effort to support them as compared to their counterparts whose mothers supported the child with less effort (Model 5).

In eTable 3, when other control factors were adjusted, the association between positive childhood relationships with the mother and lower odds of severe depression appeared to remain significant among both middle- and older-aged women and men ($p < 0.01$; except mother–child relationship for males). Experiencing higher quality relationships with their *mothers*, females had 21% ([95% CI 8–32%]) lower odds and males had 18% ([95% CI 6.2–37%]) lower odds of suffering from severe depressive symptoms in middle and oldest old age than their counterparts who had lower quality childhood relationships with their *mothers* (Model 1). Experiencing higher quality relationships with their *fathers* in childhood, females had 21% ([95% CI 8–32%]) lower odds and males had 30% ([95% CI 12–44%]) lower odds of having severe depressive symptoms in later adulthood as compared to their counterparts who had lower quality relationships with their *fathers* (Model 2).

Higher levels of mothers' attention and time in childhood appeared to be associated with decreased odds of experiencing severe depressive symptoms among both middle- and older-aged females and males. With increasing levels of mothers' attention time, females had 19% ([95% CI 8–28%]) lower odds and males had 19% ([95% CI 12–25%]) lower odds of experiencing severe depressive symptoms in later adulthood than their counterparts whose mothers devoted less attention and time to them (Model 4). With their mothers devoting more effort to support them in childhood, females had 15% ([95% CI 8–23%]) lower odds and males had 16% ([95% CI 4–27%]) lower odds of experiencing severe depressive symptoms in middle and late adulthood than their counterparts whose mothers made less effort to support them (Model 5).

Results showed some reduction in the effect size of the focal predictors when the measure of adulthood social relationships was included (eTables 2 and 3). Married females and males were likely to have lower number of depressive symptoms and odds of severe depression than those who were separated, divorced, never married or widowed (eTables 2 and 3). Both women and men who had more close relationships with their children, friends, and other family

Table 3 Negative binomial GEE models with childhood depression and focal predictors on CESD-8 scale

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<i>Female (N=7,319)—ratios of estimated count of CESD-8</i>						
Childhood depression	1.319*** (1.279–1.361)	1.261*** (1.218–1.304)	1.279*** (1.238–1.322)	1.250*** (1.208–1.293)	1.229*** (1.186–1.273)	1.229*** (1.187–1.273)
Primary predictor in each GEE model		Mother–daughter RL	Father–daughter RL	Mother–daughter and father–daughter RL	Mother’s attention	Mother’s effort
		0.905*** (0.880–0.931)	0.915*** (0.891–0.939)	0.928*** (w/ mother) 0.941*** (w/ father) (0.914–0.968)	0.931*** (0.918–0.944)	0.931*** (0.918–0.944)
<i>Male (N=5,287)—ratios of estimated counts of CESD-8</i>						
Childhood depression	1.476*** (1.405–1.551)	1.431*** (1.358–1.507)	1.413*** (1.334–1.497)	1.405*** (1.328–1.487)	1.413*** (1.346–1.483)	1.383*** (1.312–1.458)
Primary predictor in each GEE model		Mother–son RL	Father–son RL	Mother–son and father–son RL	Mother’s attention	Mother’s effort
		0.906*** (0.864–0.950)	0.869*** (0.833–0.906)	0.964 (w/ mother) 0.880*** (w/ father) (0.840–0.922)	0.929*** (0.909–0.949)	0.917*** (0.896–0.938)

Notes: age group variables were included in each model

*** p <0.001, ** p <0.01, * p <0.05

members appeared to have a lower number of depressive symptoms and odds of severe depression than those who had fewer close relationships (eTables 2 and 3).

Furthermore, when the childhood depression was estimated for the CESD-8 scale by gender, the result (Table 3) showed that females who experienced depression before age 18 years reported 32% ([95% CI 28–36%]) higher number of depressive symptoms in middle and late adulthood than those without childhood depression. Male who had childhood depression reported 48% ([95% CI 41–55%]) higher number of depressive symptoms in adulthood than those without childhood depression. When each focal family variable was added to the model separately (Models 2–6), the ratio of estimated number of depressive symptoms decreased (ranging from 4 to 9% drop in the ratio among females; ranging from 4.5% to 9.3% drop in the ratio among males).

The association between positive parent–child relationships and percentage of severe depressive symptoms by age groups after adjustment was best presented in graphs. Wald tests show that differences in percentage of severe depressive symptoms by levels of parent–child relationships in every age group were statistically significant (p <0.01 or p <0.001). Both women (Fig. 1A) and men (Fig. 1B) who experienced positive mother–child or

father–child relationships before age 18 years tended to have lower percent of severe depressive symptoms across all age groups from ages 51 to 95 years compared to those who had poor mother–child or father–child relationships. Besides, females and males who experienced positive relationships with *both* parents appeared to have the lowest percent of severe depressive symptoms, while those who had poor relationships with *both* parents appeared to have the highest percent of severe depressive symptoms from ages 51 to 95 years.

In addition, the gap in the percentage of severe depression symptoms between ages 51 and 95 years by levels of mother–child relationship and relationships with both parents was wider for females than for males. This conformed to the result from the interaction scales for mother–child relationship and gender (Table 4). Both the additive scale and multiplicative scale were positive. This indicated that the association between positive mother–child relationships and lower probability of severe depressive symptoms appeared to be stronger for females than males. However, differences in percentage of depression by levels of *father*–child relationships appeared to be similar for women and men at every age group.

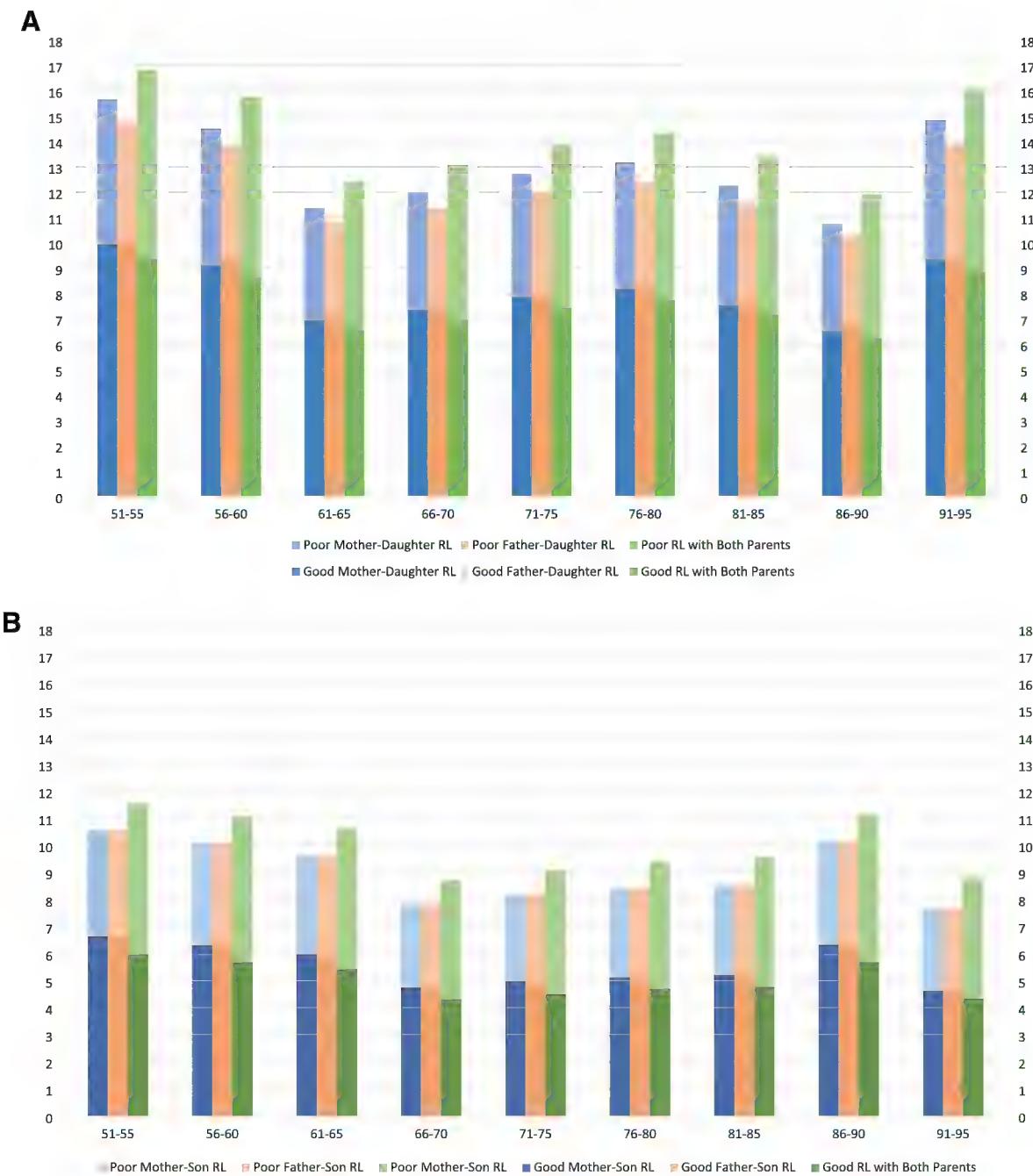


Fig. 1 **A** Percent of severe depression by levels of mother–child or/and father–child relationships across ages 51 to 90 years among females. **B** Percent of severe depression by levels of mother–child or/and father–child relationships across ages 51–90 years among males

Discussion

Few studies have used a developmental approach to examine the association between childhood family life and long-term mental health in adulthood. This study focused specifically on how the quality of mother–child and father–child relationships and maternal support alleviates depression in middle and older adulthood, providing a new contribution to the

research on the linkage between early family experiences and lifelong mental health development.

Several key findings from this longitudinal study with national representation were highlighted. First, changes in the estimated number of depressive symptoms by age groups indicated a U-shape pattern from mid- to late life. Levels of depressive symptoms as measured by the CESD-8 started higher than the grand mean in the early

Table 4 Logistic GEE models for severe depressive symptoms by mother–child relationship and gender and their additive and multiplicative scale for interaction

	Poor mother–child RL (0)			Good mother–child RL (1)		
	Odds ratio (95% CI)	P-value	Est. probability (95% CI)	Odds ratio (95% CI)	P-value	Est. probability (95% CI)
Male (0)	1 (reference)	–	0.100 (0.081, 0.120)	0.576 (0.450, 0.736)	0.000	0.060 (0.054, 0.067)
Female (1)	1.446 (1.125, 1.859)	0.004	0.139 (0.124, 0.153)	1.001 (0.753–1.330)	0.996	0.085 (0.079, 0.091)
Additive and multiplicative scale for interaction between gender and mother–child relationship						
Additive scale for interaction ^a	0.014 (-0.012, 0.040)	0.298				
Multiplicative scale for interaction ^b	1.018 (0.757, 1.279)	0.000				

^aIf the additive scale is > 0, it means positive interaction

^bIf the multiplicative scale is > 1, it means positive interaction

fifth decades, gradually decreased below the mean from 56 to 70 years, and increased gradually above the mean from 71 to 95 years, reaching the highest between ages 91 and 95 years. When the percentage of severe depressive symptoms (four or more symptoms) was estimated, the percentage was also highest among the youngest middle-aged and oldest-old age groups. Percentage of severe depression followed a general U-shape changing pattern as well between ages 56 and 90 years (except higher percentage among ages 76–80 years than ages 61–75 and 86–90 years). Second, gender differences in the level of depressive symptoms as measured by CESD-8 and percentage of severe depression were found, with females reporting more depressive symptoms than males among middle and older adults.

Third, positive childhood relationships with mothers and higher levels of mothers' support appeared to significantly buffer against depressive symptoms. The presence of high-quality childhood relationships with both parents was likely to be especially beneficial for the psychological well-being of women and men in middle and older adulthood. Those who experienced poor relationships with both parents tended to show vulnerability to a significantly higher risk of depression in later adult life.

Fifth, positive relationships with mothers and maternal support appeared to have a better protective effect against developing depression in adulthood among females as compared to males. Sixth, contrary to common perception, fathers were found to play a critical role in fostering healthy mental development in adulthood among both females and males. Positive childhood relationships with fathers were likely to be protective against depressive symptoms among both middle and older-aged women and men. Especially, males likely benefited more psychologically than females from a positive relationship with the father than mother–son relationships.

This study also suggests that the benefits of positive parent–child relationships and maternal support continue to be robust for long-term healthy psychological development among women and men from middle to old adulthood even after the adjustment of other lifelong risk or protective factors.

These findings imply that positive mental health starts early in life. While substantial research focused on the short-term association between family environment and mental health in young age (e.g., [9, 55, 58]), this study suggests that maternal support and positive childhood relationships with mothers, fathers, or both parents tends to withstand the test of time. More broadly speaking in terms of mechanism, high-quality parent–child relationships during early family life likely provide emotional support and coping assistance for their children. This appears to help individuals to develop sense of security, self-worth, emotional assurance, coping strategies, and problem-solving skills that are likely to maintain healthy emotional well-being with lifelong health benefits [24, 34, 88].

Positive parenting may not only promote the healthy development in childhood, adolescence, and young adulthood [4, 13], but it may also continue to positively influence mental development into late adulthood among both women and men. This study also found the significant association of these family measures with adulthood depression when childhood depression was included in the model that showed the developmental changes in depression from childhood to late adulthood. Positive parenting may potentially buffer in some degree the developmental changes from childhood depression to mental health in adulthood [77, 89]. Although adults may carry traumatic emotional marks from earlier negative life experiences while battling challenges in middle and older age, positive parent–child relationships and maternal support likely continue to promote lifelong psychological well-being.

Self-esteem support, belonging support, appraisal support, and instrumental support through good relationships with parents can cultivate improved social skills to develop external social ties which are important for mental development (e.g., [26, 90–92]). Findings in this study suggest that a stable married status and increasing social relationships with friends, children, and other family members during adulthood appear to provide a partial pathway through which positive parental love and support in young age and lower levels of depressive symptoms in adulthood are associated. Positive childhood family relationships may foster positive relationships in marriage and with others to promote mental health in middle and late adulthood. In addition, brain structuring, and physiologic and neuroendocrine system regulation could also be developed adequately through healthy family relationships and parental support, which may promote skills and abilities to cope with lifelong stress to reduce mental distress over time [31, 32].

This research provides implications for preventive methods of mental disorders, targeting the home environment to equip parents with skills to develop positive parent–child relationships. While mothers are often regarded as the primary caregivers and source of emotional support for their children, this study suggests that special intervention strategies are needed to improve father–child, especially father–son relationships [19, 93]. Both fathers and mothers play an important role in reducing children's, especially sons', vulnerability to negative mental health outcomes and fostering their children's lifelong healthy mental development. This may, in turn, decrease the risk of premature midlife deaths of despair or late-life dementia.

This study emphasizes the need for preventive interventions of depression in early family life. Mental health clinicians and education professionals should target childhood for intervention to improve parent–child relationships. Public health initiatives can be developed to teach and encourage both mothers and fathers to foster positive relationships and support for their children. This is likely to be mostly effective to cultivate family environment for healthy mental development from childhood to late adulthood. In addition, developing feasible psychoanalysis of early family life may aid adult patients to recognize reasons of their mental problems and discover tools to combat against the carryover negative effects of their early life [94].

Although this study provides the first comprehensive evidence about childhood parent–child relationships and maternal support and their positive long-term effect on mental health in middle and late adulthood, some limitations and directions for future research need to be discussed. First, as this study was able to use alternative measures such as maternal support to find its protective effect on adulthood mental health, future research could collect data on paternal support to examine fathers' support and its role in protecting

children's lifelong mental health. Future studies could also direct more attention on examining the mechanisms through which positive early family life protects lifelong mental development.

Second, the report of parent–child relationships was retrospective. As such, the measurement may not be as accurate as reported and may lead to recall bias of either under- or overreporting. However, previous evidence suggested that retrospective reports are reliable as older adults tend to remember salient childhood events and experiences [95, 96]. In addition, retrospective reports of parent–child relationships and maternal support were collected at one time and not asked about age-specific experiences. Future studies can collect data on age-specific family experiences retrospectively or prospectively. In this way, time-varying or cumulative early family measures can be used to assess in more depth the association between the event-history of early family life and mental development from early to late life. Besides, mother–child and father–child relationships from HRS were summary one-question measures for an overall assessment. Future studies can design questionnaires or develop instruments to collect data for enriched pictures of parent–child relationships in early life. This may provide insights for specific intervention methods to improve parenting practices for the benefits of the child's short-term and long-term mental health till late life.

Although this study controlled for some childhood risk factors, such as childhood depression and physical abuse, there are likely other forms of childhood adversity that may be associated with depression, such as sexual abuse and changes in family structure [97–100], parental depression, and general physical health of respondents [4, 77]. An extended list of adversity measures cannot be included due to data limitations. Despite this, using another longitudinal data (Add Health), this study conducted a sensitivity analysis which adopted a proxy measure of parental feelings of unhappiness to reflect parental depression. It found that protective effect of family relationships against depressive symptoms from early adolescence to middle adulthood continued to be significant after the adjustment of this proxy measure. From this finding, we may hypothesize that positive effect of parent–child relationships likely continues to protect individuals against depressive symptoms in later adulthood when parental depressive mood is accounted for. HRS, though not perfect, has its advantage, as it possesses some data with early family measures. Future research can improve by collecting more data with enriched childhood adversity measures for the study of mental health outcomes for early life till late adulthood.

In addition, although the study used a cutoff of four items for severe depressive symptoms, it is not a direct measure of a clinical diagnosis. Future studies could use clinically validated definitions of depression to replicate

this study and examine whether the findings could be applied to clinically sick patients. Besides, this study excluded institutionalized respondents (e.g., residents in nursing homes), as sampling weights of this sub-group were not available for statistical analyses. This may underestimate the level of depression for the old population reported in this study. Although the number of respondents with one time measure for outcome variables comprised of a tiny portion of the sample and its effect on estimation may be minimal for this study, one thing to note that they only contributed to the mean estimation of the outcomes for the age range as data on depression measures were not available for other age ranges.

Due to the possible censoring of the elderly population and increased mortality among older adults, those who survive may be psychologically healthier than censored older respondents. Future studies could examine whether positive parent–child relationships are associated with longevity due to a better quality of psychological well-being. This study applied a common approach to analyze longitudinal data of depressive symptoms [75, 101] and used weights to correct some bias from non-response (due to various reasons, including death). Future studies can use different statistical methods, such as competing risk analysis, to assess whether positive early family relationships can prolong life with improved mental health. Lastly, although this study dropped the cohort variable in multivariate analysis as no cohort variation was found for levels of depressive symptoms by age groups and its association with focal family predictors, future studies may use data from other countries or samples to assess the non-cohort effects.

In conclusion, findings provide new understanding of the long-term association between early mother–child and father–child relationships and development of mental health till late adulthood. This study calls for more research to understand positive family processes in early life and examine their health benefits for lifelong psychological development till late life.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s00127-021-02200-y>.

Declarations

Conflict of interest On behalf of all the authors, the corresponding author states that there is no conflict of interest.

Ethical standards statement This study used public survey data from the Health and Retirement Study which have gone through the approval of the Institutional Review Board for data collection and released. Thus, the effect that this human study has been approved by the appropriate ethics committee and have, therefore, been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

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